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Assessing the Impact of Agroforestry on Sustainable Livelihood in Langel Village, Tofa Local Government Area, Kano State

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ABSTRACT

In Langel Village, agroforestry practices are integral to food security, securing sustainable livelihoods, incorporating social and cultural trees. However, there is a need to comprehensively assess their role. Engaging the local community in research can empower them with sustainable land management skills. The study aims to assess agroforestry's contributions to sustainable livelihoods in Langel Village, focusing on economic, ecological, and socio-cultural dimensions, and provide evidence-based recommendations for enhancing its adoption and sustainability. Purposive sampling technique was used to select Langel village whereas simple random sampling procedure was used to select 120 respondents through well-structured questionnaire for the study. The data collected were analysed with descriptive statistics. The study found that agroforestry in the area is practiced by middle-aged, married men. Most have some formal education, while all of them have Islamic education and many years of farming experience. The most common agroforestry practices in the area are scattered trees on farmland, boundary planting, and home garden. Farmers in the study area reported that agroforestry increases their household income and food security. In conclusion, agroforestry offers a range of benefits for farmers in Langel village. It increases household income, food security, improves soil structure, fertility, biodiversity, and strengthens social bonds and cultural identity.

Keywords: *Agroforestry, Sustainable Livelihood, Langel Village, and Kano State*

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INTRODUCTION

Agroforestry has been defined in many ways over the last three decades. It has started gaining more attention by researchers. Agroforestry is an intensive land Management practice in which trees and/ or shrubs are deliberately incorporated with crops in an agricultural setting (Gold and Garrett, 2009). ICRAF, 2004, defined it as collective term for land use systems and practices whereby woody perennials are intentionally integrated with crops and/or animals on the same land management unit. Traditional rural livelihood analyses often overlook the

significance of environmental products, especially forest and agroforest products, as noted by Babulo, (2008). Nonetheless, agroforestry, a practice with roots stretching back millennia in agrarian societies worldwide (Garrity 2006). The World Bank estimates that 1.2 billion people practice some form of agroforestry on their farms and in their communities (World Bank 2004). Despite its long-standing use among farming communities, there remains insufficient awareness regarding its potential benefits among millions living in poverty (Garrity, 2006). In Langel Village, situated within the Tofa Local Government Area of Kano State, Nigeria, the intersection of agriculture, land use, and livelihoods presents a complex set of challenges and opportunities. As a rural community, Langel village, grapple with the effects of climate change, population growth, and environmental degradation, it becomes increasingly important to assess and address the specific issues surrounding agroforestry and its contribution to sustainable livelihoods and environmental amelioration. Agroforestry is recognized as a sustainable land-use system that can improve soil fertility, enhance biodiversity, and mitigate the adverse effects of climate change (Nair, 2012). As environmental concerns grow globally, assessing the contribution of agroforestry to sustainability in Langel Village becomes crucial, serving as a potential model for sustainable land management in the region, state and the nation. This project seeks to build upon existing knowledge by conducting an assessment of agroforestry practices within Langel Village. It draws inspiration from prior research that underscores the potential of agroforestry to contribute to sustainable livelihoods in rural areas (Franzel, 2004). The aim of this study is to assess the impact of agroforestry to sustainable livelihoods, using Langel village, Tofa Local Government Area, Kano State, as case study, while focusing on economic, ecological, and socio-cultural dimensions, and to provide evidence-based recommendations for enhancing its adoption and sustainability.

METHODOLOGY

Description of Study Area

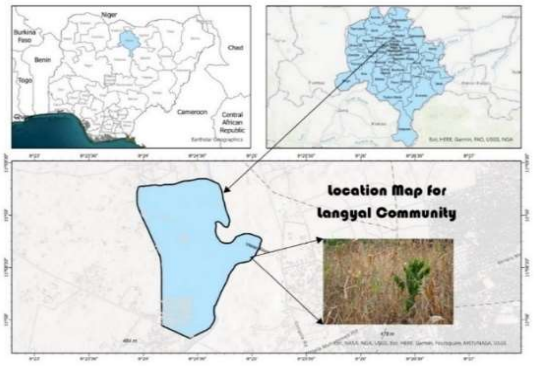

Figure 1: Map of the study area (Langel Village)
Sources: Google Earth, 2023

This research was carried out in Langel village (Figure 1) located within Tofa local government area of Kano state. The village is sub-divided into four parts of; Launawa, Langel Cikin Gari, Unguwar Arewa and Hayewa. The major source of livelihood in this village is farming, trading and animal keeping. It is located within the Sudan savannah ecological zone of Nigeria. Langel village lie between latitude 11°59'N in the North and 11°57'N in the South and longitude 8°23'W in the West and 8°25'E in the East with mean annual rainfall between 800mm to 1,200mm, and mean annual temperature in the area is usually around 27°C to 30°C, with hottest month being March and May. The area is endowed with Scattered tree species on the farms include Indigenous species of; *Parkia biglobosa, Tamarindus indica, Acacia nilotica, Faidherbia albida, Zizziphus spinchristii, Zizzipus mauritiana, Piliostigma reticulatum, Borasus aethiopum*, *Phoenix dactylifera, Adansonia digitata,* and exotics such as *Azadirachta indica*, and *Eucalyptus camaldulensis, Mangifera indica, Anacardium occidentale,* and *Psidium guajava.*

Sampling Technique and Sample Size

Purposive sampling technique was used to select Langel village in Tofa Local Government Area, Kano State as the study area. This is with a view to contribute to the development of the neighboring communities of the University. Simple random sampling was used to select respondents from each of the four parts. In all one hundred and twenty (120) respondents were sampled. Data collection was collected using structured questionnaire. The formula was use used to determine the sample size based on the statistical procedure of (https://www.qualitics.com), where z is confidence interval (90, 95, 99%), Standard Deviation of 0.5 and Margin error of ±5%.

Sample Size =

$$\frac{(\text{Z score})^2 \times \text{Standard Deviation} \times (1-\text{Standard Deviation})}{(\text{Margin of error})^2}$$

Data Collection

Three methods of data collection were employed and they are, structured questionnaire, group discussion and interview with key informants. The questionnaire was administered to the head of household which covered areas such as Demographic Characteristics of Respondents, Agroforestry Practice, Livelihoods, Ecosystem Function/Service, Socio-Cultural Dimensions, Adoption Barriers and Recommendations.

Data Analysis

Data were arranged in Statistical Package for Social Science (SPSS). Age, family size, years of residence,

number of wives and farming experience of the farmers were grouped based on an overall distribution of the respective data while educational qualification of the farmers was categorized based on the level of schooling (primary, secondary, tertiary, vocational and Islamiyyah). Responses on types of agroforestry systems practiced, reasons, benefits and challenges were expressed in frequency count based on the number of respondents and percentage using descriptive statistics with the software IBM SPSS V16 x 86 version.

Results

Table 1a presents the demographic characteristics of the respondents in the study. It includes variables such as age, language, gender, and marital status, number of wives, household size, educational background, years of residence, and years of farming.

Table 1a: Demographic Characteristics of the Respondents

Variable	Frequency	Percentage (%)	Mode
Age (Years)			
≤ 20 – 29	20	16.7	
30 – 39	11	9.2	
40 – 49	44	36.7	40 – 49
50 – 59	38	31.7	
60 above	7	5.8	
Total	120	100.0	
Language			
Hausa/Fulani	120	100.0	Hausa/Fulani
Total	120	100.0	
Gender			
Male	115	95.8	Male
Female	5	4.2	
Total	120	100.0	
Marital Status			
Married	88	73.3	Married
Single	32	26.7	
Widow	-	-	
Total	120	100.0	
Numbers of Wives			
1 – 2	49	40.8	1 – 2
3 – 4	35	29.2	
No wife	36	30.0	
Total	120	100.0	

Source: Field Survey, 2023

The majority of respondents fall within the age range of 40-49, accounting for 36.7% of the total. This is followed by the 50-59 age group at 31.7%. Respondents aged 60 and above are the least represented at 5.8%. All respondents are Hausa/Fulani speakers. The majority of respondents are male, accounting for 95.8% of the total. Females make up only 4.2%. Most respondents are married (73.3%), while the rest are single. A significant portion of respondents (40.8%) have 1-2 wives, followed by those with 3-4 wives (29.2%). 30% of respondents have no wife. The majority of households have 11-20 members (43.3%), followed by households with 21-30 members (24.2%). Most respondents have a vocational education (49.2%), followed by secondary education (27.5%). A smaller percentage have tertiary education (10.8%), and the lowest percentage have primary education (12.5%). The largest group of respondents has lived in their current location for 41 years or more (49.2%). Respondents have been farming for various lengths of time, with the largest group (27.5%) farming for 1-10 years. Table 1b and 1c provide additional demographic characteristics, including place of residence, state of origin, primary occupation, and secondary occupation. The majority of respondents reside in Langel, Kano State, and are primarily engaged in farming as their main occupation, with some having secondary occupations like civil service, trading, or being a student.

Table 1b: Demographic Characteristics of the Respondents

Variables	Frequency	Percentages	Mode
Household size			
01 – 10	33	27.5	
11 – 20	52	43.3	11 – 20
21 – 30	29	24.2	
31 – 40	6	5.0	
Total	120	100.0	
Educational Background			
Primary	15	12.5	
Secondary	33	27.5	
Vocational	59	49.2	Vocational
Tertiary	13	10.8	
Total	120	100.0	
Islamiyyah	120	100.0	Islamiyya
Total	120	100.0	
Years of Residence			
1 – 10	1	0.8	
11 – 20	30	25.0	
21 – 30	17	14.2	
31 – 40	13	10.8	
41 above	59	49.2	41 above
Total	120	100.0	
Years of Farming			
1 – 10	33	27.5	1 – 10
11 – 20	22	18.3	
21 – 30	13	10.8	
31 – 40	24	20.0	
41 above	28	23.3	
Total	120	100.0	

Source: Field Survey, 2023

Table 1c: Demographic Characteristics of the Respondents

Variables	Frequency	Percentages	Modes
Place Of Residence			
Bachirawa	1	0.8	
Dandinshe	1	0.8	
Langel	118	98.3	Langel
Total	120	100.0	
State of Origin			
Kano	120	100.0	Kano
Total	120	100.0	
Primary Occupation			
Barbing	1	0.8	
Civil servant	6	5.0	
Driver	3	2.5	
Farming	77	64.2	Farming
Housewife	3	2.5	
Poultry farming	1	0.8	
Retired driver	2	1.7	
Security	1	0.8	
Student	20	16.7	
Trading	6	5.0	
Total	120	100.0	
Secondary Occupation			
Civil servant	3	2.5	
Farming	41	34.2	
No secondary occupation	59	49.2	No secondary
Poultry	1	0.8	
Student	3	2.5	
Trading	13	10.9	
Total	120	100.0	

Source: Field Survey, 2023

Table 2a: Type of Agroforestry System Adopted by the Respondents in the Study Area

Variables	Frequency	Percentages (%)
Types of Agroforestry system practice in Langel village		
Agrosilviculture (Alley Cropping/Scattered Trees/Boundary Planting/Windbreak/Home Garden)	114	95.0
Agrosilvopastoral	6	5.0
Silvopastoral	-	-
Total	120	100.0
Years of Practicing Agroforestry		
1 – 10	35	29.2
11 – 20	23	19.2
21 – 30	13	10.8
31 – 40	21	17.5
41 - <50	28	23.3
Total	120	100.0

Source: Field Survey, 2023

Table 2a presents the types of agroforestry systems adopted by the respondents in the study area, as well as the years of practicing agroforestry. The majority of respondents (95.0%) practice agrosilviculture, which includes alley cropping, scattered trees, boundary planting, windbreaks, and home gardens. A small percentage (5.0%) practice agrosilvopastoral, which combines tree planting with livestock rearing. There are no respondents practicing silvopastoral agroforestry in the study area. Respondents have been practicing agroforestry for varying lengths of time. The largest group (29.2%) has been practicing for 1-10 years, followed by 11-20 years (19.2%), 31-40 years (17.5%), and 41-<50 years (23.3%). Table 2b provides a list of agroforestry tree species in the study area, including their scientific names, common names, and local names in Hausa. Some of the tree species include Tamarind (*Tamarindus indica*), Neem (*Azadirachta indica*), Baobab (*Adansonia digitata*), Mango (*Mangifera indica*), and Cashew (*Anacardium occidentale*).

Table 2c provides information on the reasons for adopting a particular type of agroforestry, as well as the perceived benefits of trees to humans and animals, and the general benefits derived from agroforestry. The most common reason for planting or retaining trees in agroforestry systems is as a source of income, cited by 43.3% of respondents. Trees are also valued as a source of food by 24.2% of respondents. 18.3% of respondents value trees for providing shade. A small percentage (2.5%) see trees as a way to prevent erosion. 11.7% of respondents value trees as a source of fuel wood. The majority of respondents (90.8%) see trees as a source of livestock fodder. A small percentage (3.3%) see trees as a source of food. 5.8% of respondents see trees as providing both livestock fodder and food. 65.0% of respondents see agroforestry as a way to increase income. 21.7% of respondents believe that agroforestry improves crop yields. A small percentage (3.3%) see agroforestry as a way to supplement energy needs. 3.3% of respondents value agroforestry for providing both shade and fodder. 6.7% of respondents see agroforestry as a way to improve soil fertility. Table 2d focuses on the benefits of agroforestry in farming systems. The majority of respondents believe that agroforestry improves soil fertility (41.7%) and increases crop yield (44.2%). A smaller percentage (14.2%) see agroforestry as providing both improved soil fertility and increased crop yield. Table 3 provides information on livelihood diversification and economic resilience related to agroforestry practices. All respondents (100.0%) reported that agroforestry practices have increased their household income. Only a small proportion of respondents (20.8%) reported diversifying their sources of income through agroforestry. The majority of respondents (79.2%) did not report diversifying their sources of income through agroforestry. The majority of respondents (91.7%) reported that agroforestry practices have increased their household food security. A small proportion of respondents (8.3%) reported that agroforestry practices supplement agricultural produce to prevent household food scarcity. The majority of respondents (95.8%) reported facing challenges in the economic aspect of agroforestry. Only a small proportion of respondents (4.2%) reported not facing challenges in the economic aspect of agroforestry. The results indicate that agroforestry practices have had a positive impact on household income and food security for the majority of respondents. However, there are challenges in the economic aspect of agroforestry that need to be addressed.

Table 4 provides information on ecosystem functions and services related to agroforestry practices. The majority of respondents (78.3%) reported changes in soil fertility due to agroforestry practices. A smaller proportion of respondents (21.7%) reported no changes in soil fertility due to agroforestry. The majority of respondents (90.0%) reported improvement in soil moisture content or retention due to agroforestry practices. A smaller proportion of respondents (10.0%) reported no improvement in soil moisture content or retention due to agroforestry. The majority of respondents (86.7%) reported changes in local wildlife or biodiversity due to agroforestry practices. A smaller proportion of respondents (13.3%) reported no changes in local wildlife or biodiversity due to agroforestry. The results indicate that agroforestry practices have positive impacts on soil fertility, soil moisture content, and local wildlife or biodiversity in the study area. Table 5 provides information on the socio-cultural dimensions of agroforestry practices. All respondents (100.0%) reported that agroforestry practices have positively influenced social interactions and cooperation. The majority of respondents (94.2%) reported that agroforestry practices hold cultural significance or traditional value. A smaller proportion of respondents (5.8%) reported that agroforestry practices do not hold cultural significance or traditional value. The majority of respondents (96.7%) reported the existence of specific cultural practices related to agroforestry. A smaller proportion of respondents (3.3%) reported no specific cultural practices related to agroforestry. The results suggest that agroforestry practices play an important role in social interactions,

Table 2b: Agroforestry tree species in the study area

Scientific name	Common Name	Local Name (Hausa)
Tamarindus indica	Tamarind	Tsarmiya
Azadirachta indica	Neem	Dalbejia
Ceiba pentandra	Kapok tree	Rimi
Adansonia digitata	Baobab	Kuka
Psidium guajava	Guava	Gwaiba/Goba
Mangifera indica	Mango	Mangwaro
Moringa oleifera	Moringa	Zogole
Cola nitida	Kola nut	Gworo
Anacardium occidentale	Cashew	Kashu/Yazawa
Pakia biglobosa	Locus beans	Dorawa
Eucalyptus camaldulensis	Eucalypts	Turare
Phoenix dactylifera	Date	Dabino
Diospyrus mespiliformis	Ebony	Kanya
Acacia nilotica	Acacia	Bagaruwa
Borasus aethiopum	Fan palm	Giginya
Piliostigma reticulatum	Camel foot	Kargo
Ziziphus spinchristii	Christi's thorn	Kurna
Faidherbia albida	Ana tree	Gawo
Ficus thonningii	Strangler Fig	Chediya
Ziziphus mauritiana	Indian plum	Magarya

Source: Field Survey, 2023

Table 2c: Reason for Adopting a Type of Agroforestry

Variables	Frequency	Percentage (%)	Mode
Reason for planting or retaining the trees			
Source of income	52	43.3	Source of income
Source of food	29	24.2	
Source of shade	22	18.3	
Prevent erosion	3	2.5	
Source of fuel wood	14	11.7	
Total	120	100.0	
Benefits of tree to man or animals			
Source of livestock fodder	109	90.8	Source of livestock fodder
Source of food	4	3.3	
Source of livestock fodder and food	7	5.8	
Total	120	100.0	
General benefits from agroforestry			
Increase income	78	65.0	Increase income
Improved crop yield	26	21.7	
Supplement energy needs	4	3.3	
Source of shade and fodder	4	3.3	
Improved soil fertility	8	6.7	
Total	120	100.0	

Source: Field Survey, 2023

Table 2d: Benefits of Agroforestry in Farming System

Variables	Frequency	Percentage (%)	Mode
Benefits of agroforestry in farming system			
Improved soil fertility	50	41.7	
Increase crop yield	53	44.2	Increase crop yield
Improved soil fertility and increase crop yield	17	14.2	
Total	120	100.0	

Source: Field Survey, 2023

Table 3: Livelihood Diversification and Economic Resilience

Variables	Frequency	Percentage (%)
Agroforestry influence on household income		
It increases household income	120	100.0
Total	120	100.0
Diversification of source of income		
Yes	25	20.8
No	95	79.2
Total	120	100.0
Agroforestry to food security		
It increases household food	110	91.7
It supplements agricultural produce to prevent household food scarcity	10	8.3
Total	120	100.0
Challenges in the economic aspect of agroforestry		
Yes	115	95.8
No	5	4.2
Total	120	100.0

Source: Field Survey, 2023

Table 4: Ecosystem Functions/Services

Variables	Frequency	Percentage (%)	Mode
Changes in soil fertility due to agroforestry			
Yes	94	78.3	Yes
No	26	21.7	
Total	120	100.0	
Improvement in soil moisture content/retention			
Yes	108	90.0	Yes
No	12	10.0	
Total	120	100.0	
Change in local wildlife or biodiversity			
Yes	104	86.7	Yes
No	16	13.3	
Total	120	100.0	

Source: Field Survey, 2023

Table 5: Socio-Cultural Dimensions

Variables	Frequency	Percentage (%)
Agroforestry influence on social interactions and cooperation		
Positively	120	100.0
Negatively	-	-
Total	120	100.0
Agroforestry holding cultural significance or traditional value		
Yes	113	94.2
No	7	5.8
Total	120	100.0
Specific cultural practices related to agroforestry		
Yes	116	96.7
No	4	3.3
Total	120	100.0

Source: Field survey, 2023

Table 6: Adoption Barrier

Variables	Frequency	Percentage (%)	Mode
Main challenges in adopting agroforestry			
Insecurity	3	2.5	
Lack of capital	114	95.0	Lack of capital
Pests/ diseases	3	2.5	
Total	120	100.0	
Support from government			
Yes	42	35.0	
No	78	65.0	No
Total	120	100.0	

Source: Field survey, 2023

cooperation, cultural significance, and traditional values in the study area. Table 6 presents information on the adoption barriers to agroforestry practices. The majority of respondents (95.0%) reported lack of capital as the main challenge in adopting agroforestry practices. A very small proportion of respondents (2.5%) reported insecurity as a challenge. Another small proportion of respondents (2.5%) reported pests or diseases as a challenge. A minority of respondents (35.0%) reported receiving support from the government for agroforestry practices. The majority of respondents (65.0%) reported not receiving support from the government. The results indicate that lack of capital is the primary barrier to adopting agroforestry practices, while there is limited support from the government in this regard. Other challenges such as insecurity and pests/diseases are reported by a small percentage of respondents.

DISCUSSION

Demographic Characteristics of the Respondents

Majority of the respondents (68.4 %) were within the range of 40-59 years old. This indicated that high percent of the respondents who engaged in agroforestry practice were middle adulthood aged with experience and skills. This is contrary to the work of Gebru *et al.,* (2019) that young people are the majority of the household members that engaged in agroforestry practice. This shows that middle aged farmers were the active human resource in the practices of agroforestry in the study areas. Ajayi *et al.,* (2007) reported that middle aged people are more likely to be better agents for new skills adoption and transfer as they may have higher aspiration to accept new technologies compared to older farmers who are sceptical

and critical of innovations (Table 4). All the respondents (100%) of the respondents were Hausa/Fulani. Also, 95.8% of the respondents' gender were male while 4.2% were female. This implies that the male gender is more involved in agroforestry practices and other farming activities compared to their female counterparts. However, farming involves different types of activities and the respondents responded that female is more involve in the harvesting, processing and sometimes marketing aspect of agriculture. About 26.7% of the respondents were single while majority of the respondents (73.3%) across the study area are married, with 40.8% having 1 – 2 wives, 29.2% having more than two wives while 30.0% have no wife (Table 4.1a), majority of respondents (43.3%) have a family size of 11 - 20 persons/household, 27.5% having 1 – 10, 24.2% having 21 – 30 and 5.0% having 31 – 40 persons/household (Table 4). This is in agreement with Obasi *et al.,* (2012) and Oyebamiji *et al*., (2014) who reported in their separate studies that majority of farmers who practice agroforestry in Nigeria are married and inferred that large household is advantageous in farming as labour may be derived from the household members. All the respondents (100%) in the study area responded to have Islamic and Qur'anic education.

However, 49.2 % responded to have no formal education (vocational studies) while 50.8 % had, (12.5% primary education, 27% attended secondary school and only 10.8% attended up to tertiary education) (Table 1b). This shows that 49.2% of the respondents did not have formal education. This indicated that 50.8% of the respondents who were involved in agroforestry practice in the study area have formal education which means formal education is important to the farmers that practice agroforestry, however, embracing practical experience overtime is also important, this result is in agreement with submission of Gebru *et al.,* (2019) that the level of literacy has a significant effect on agroforestry practice. Years of farming experience refers to the duration at which a farmer has been into farming, and this study showed that, 27.5% of the respondents have experience between 1 to 10 years, 18.3% had 11 – 20years, 20.0% had 31 – 40years, 10.8% had 21 – 30 years and followed by 23.3% of the respondents having an experience of 40 years and above. Although, farmers tend to be more efficient and gain more experience in farming through learning as noted by Jamala *et al.* (2013) (Table 1b). About 1.7% of the respondents are not resident of the study area (0.8% of the respondents are from Bachirawa and 0.8% of the respondents are from Dandinshe) while the majority (98.3%) of the respondents are residence of the study area (Langel Village) with majority (49.2%) resided in the study area for the past 41 years, 25.0% resided between 1 – 10 years, 14.2% resided between 21 – 30 years, 10.8% resided between 31 – 40 years and 0.8% of the respondents have resided between 1 – 10 years (Table 1c). Majority 64.2% of the respondents' primary occupation is farming, as the people in the study area are predominantly agrarian that rely on farm produce and tree products as their major source of food and income. This study is in line with Vihi *et al*. (2019) in their research on adoption of agroforestry practices among farmers in Gwaram Local Government Area of Jigawa State. The majority (49.2%) of the farmers across the study area responded not to have any secondary occupation, while, 41% of the respondents responded that farming was their secondary occupation (Table 1c).

Type of Agroforestry System Adopted by the Respondents in the Study Area

The distribution of the most predominant agroforestry systems/practices found in the study area are scattered trees on farmland, boundary planting, windbreak, home garden with crops, and shade trees. It was observed that the most common agroforestry system employed in the study area (Langel village) was Agrosilviculture which includes all the aforementioned Agroforestry practices. According to Roger (2003), if farmers had more consistently implemented agroforestry practices, they could have reaped greater benefits from these systems. The agroforestry practices would have also afforded the farmers better livelihood and friendly environment and ecological balance (Table 4). Farmers were practicing agroforestry for different periods, about 27.5% of the respondents in the study area had been practicing agroforestry for 1–10 years, 23.3% for more than 41 years, 19.2% for 11- 20 years, 17.5% for 31- 40 years and 10.8% for 21 – 30 years (Table 2a). All the respondents (100%) in the study area retain Mango, Baobab, Ebony, Cashew, Neem, Moringa, and Tamarind trees in their farms because of their economic importance, most of the farmers have Locus beans, Date palm, Fan palm, Camel foot, Christi's thorn, Indian plum and Ana tree while Eucalypt tree, is the least tree retained or planted by farmers in the study area. This is due to the allelopathic property of the tree on agricultural crops (Table 4). This is in agreement with Jagger and Pender (2000), who stated in their study that, the species of Eucalyptus do not provide organic matter and depletes soil nutrients needed by agricultural crops, it depletes water resources and competes with agricultural crops, and it suppresses ground vegetation and resulting unsuitability to soil erosion control. The leaves of Eucalypt tree are not palatable and cannot be used as fodder species.

Reason for Adopting a Type of Agroforestry

The reasons for the respondents in the study area practicing agroforestry to retained trees on their farms is purposely for sources of income (43.3%), source of food (24.2%), Shade (18.3%), Source of fuel wood (11.7%) and prevent erosion (2.5%) (Table 2c). The respondents in the study area derived benefits from the trees such as source of fodder to livestock with majority of 90.8%, 3.3% as source of food and 5.8% as both source of livestock fodder and source of food (Table 2c). Majority (44.2%) of the respondents in the study area reported that they have

observed increase in crop yield in their farm due to the presence of trees in the farmland, 41.7% reported to have observed improved soil fertility and 14.7% reported to have observed both increase in crop yield and improved soil fertility as a result of trees retained in the farmland (Table 2d). From the result on Table .2c and Table 2d, it can be observed that the respondents in the study area retained trees on their farm to generate more income and as a source of food. This is in agreement with the works of Jamala *et al*., (2004) and Adewusi, (2006) who both agreed that farmers plant or retain trees on their farm land, both for food, income, soil improvement, and environmental amelioration and for shade during the harsh weather period.

Livelihood Diversification and Economic Resilience

All the respondents (100%) in the study area reported that agroforestry increases their household income (Table 3). Agroforestry plays a particularly important role in building household financial capital as households with agroforestry, and a greater number, density, and diversity of trees had higher financial composite asset scores. Selling fruits (such as; Mango, Cashew, Locus Beans) were particularly important source of income for many farmers in Langel village. Some households in this study area utilized their income from fruit sales to improve other livelihood capital assets. For example, income from fruit sales was used to improve human capital by paying school fees and providing healthy food options such as fruit (Mango, Banana, Pawpaw and Cashew) and non-fruit (Milk, Vegetables, and Meat) for the family.

This, in turn, helps increase the household's overall economic resilience. As Jacobs *et al*. (2015) explained in their study, a strong balance between the five livelihood capitals (human, social, natural, physical, and financial capital) contributes to a household's ability to withstand and recover from economic shocks. This corroborated with the works of Adekunle and Bakare (2004) and Kalaba *et al*., (2010) who opined that agroforestry contributes greatly to good production and add to per capita income of the farmers. Majority (79.2%) of the respondents in the study area reported that they did not diversify their source of income through agroforestry or other activities while 20.8% had. Indeed, households that reinvest financial capital earned from agroforestry into other types of livelihoods may in the long term be creating more resilient livelihood strategies than households that do not diversify their source of income (Table 3).

All the respondents (100%) in the study area reported that agroforestry increase household food and it also supplement agricultural produce to prevent household food scarcity with majority (95.8%) reported to be facing economic challenges while 4.2% are not affected economically (Table 3). The results suggest that in this community, agroforestry is improving the financial situation of households, and it is not simply that wealthier households are more likely to plant trees. In the household survey, the majority of respondents in Langel village, answered that trees have improved the household's income; while during the group discussions the same sentiments were repeatedly voiced. Also, the greater the number of trees a household has planted or through natural regeneration, the greater their score for financial capital and the more likely a household was to respond that trees had greatly improved their household finances. More trees can produce more fruit which can equal greater income. It is important to note, however, that the study did not quantify the income earned from agroforestry. Indeed, the amount of money earned is important, so also is the timing and ability of agroforestry as a "back-up" source of income in times of need. Thorlakson and Neufeldt (2012) assert that agroforestry can potentially improve household finances, which in turn helps households be more resilient to future shocks and disturbances, which this study buttressed. Because tree products typically have a higher value than maize or grains, harvesting tree products can buffer against income shocks (Kandji *et al*., 2006), this is in agreement with the respondents in this study. Tanner *et al*. (2015) describe livelihood resilience as the ability to sustain, or even improve their livelihood options despite disturbance, and the income provided by fruit sales may assist households to sustain themselves and their livelihoods despite ecological, political, or economic disturbances. Generally, households with fewer financial assets are more vulnerable to shocks or disturbances, particularly the impacts of climate change (Agrawal and Perrin, 2008), and therefore increasing financial capital through agroforestry may also reduce vulnerability to environmental and other shocks at a variety of geographical scales.

Agroforestry as Ecosystem Function or Service

The findings from this research showcase the significant positive impact of trees in agroforestry on various ecosystem functions/services. The statistics indicate that a substantial majority of respondents in the study area noticed changes in soil fertility (78.3%), improvement in soil moisture content (90%), and improved biodiversity (86.7%) due to the presence of trees (Table 4). Agroforestry plays a crucial role in enhancing soil fertility through mechanisms such as nutrient cycling, increased organic matter, and improved soil structure (Ecosystem functions). Trees contribute to soil moisture retention by reducing evaporation, providing shade, and fostering a microclimate creation to moisture conservation (services). Also, the presence of trees in agro-ecosystems often promotes biodiversity by offering habitats for diverse flora and fauna.

This is in agreement with the study by Jose *et al*., (2004) emphasize the positive impacts of agroforestry on soil fertility, highlighting improved nutrient cycling and soil structure. Similarly, Nair *et al*., (2010) discuss how agroforestry practices enhance soil moisture content and microclimate regulation. Also, Trees for the Future's

research (2020) underscores the role of agroforestry in boosting biodiversity and ecosystem resilience. These research findings affirm the substantial contributions of agroforestry in providing multiple ecosystem services, including enhanced soil fertility, improved moisture retention, increased biodiversity, fostering a microclimate creation to moisture conservation.

Agroforestry in Socio-cultural Dimensions

The findings from Langel Village indicate a high positive influence of agroforestry on socio-cultural aspects. The unanimous agreement (100%) that agroforestry positively impacts social interactions and cooperation underscores its significance in fostering community bonds and collaboration (Table 5). Moreover, the overwhelming majority (94.2%) acknowledging the cultural significance or traditional value of agroforestry reflects its deep-rooted importance within the community's heritage and cultural identity. This suggests that agroforestry practices are intertwined with the local culture and traditions, contributing to the preservation and transmission of cultural values across generations (Table.5), this align with the Studies by Boa *et al*., (2014) who reported how agroforestry systems are deeply embedded in cultural traditions and local knowledge, playing a vital role in preserving cultural heritage and fostering community cohesion.

Furthermore, the observation by 96.7% of specific cultural practices related to agroforestry highlights the existence of traditional knowledge associated with agroforestry activities. These practices likely serve as a means of preserving cultural heritage while maintaining sustainable land use practices (Table 5). Moreover, contributions by Franzel *et al*., (2004) highlight the importance of agroforestry in social contexts, promoting cooperation and traditional values within communities. These findings accentuate the profound sociocultural dimensions of agroforestry, illustrating its integral role in community dynamics, cultural preservation, and the continuation of traditional practices.

Agroforestry Adoption Barrier in Langel Village

The research findings from Langel Village indicate prevalent barriers to agroforestry adoption, with lack of capital being the predominant challenge. Majority (95%) of the respondents reported that Lack of Capital are their major problem in adopting agroforestry, 2.5% reported that insecurity is their major challenges while 2.5% of the respondents reported that pest attack are their major challenges in adopting agroforestry (Table 6). Limited financial resources hinder the implementation and expansion of agroforestry practices, as highlighted by 95% of respondents.

Financial constraints are a pervasive challenge for adopting agroforestry practices. Farmers often require initial investment for tree planting, acquiring seeds or seedlings, tools, irrigation systems, and training. This align with a study by (Place and Adato 2001) which found that lack of funds significantly hampers the adoption of sustainable agricultural practices, including agroforestry. In addition to financial constraints, the findings from Langel Village also note concerns such as insecurity (2.5%) and pests/diseases (2.5%) as minor yet noteworthy challenges (Table 6). Insecurity can refer to the threat of violence, conflict, or land disputes or theft that may affect the safety and stability of the farmers and their agroforestry systems and or practices. Pests/diseases can refer to the damage caused by insects, diseases, or animals to the crops or trees in agroforestry systems. In areas affected by insecurity such as theft of agricultural equipment or seedling for agroforestry or minor forest products, or agricultural activities are severely disrupted.

This aligns with the studies by World Bank Group (2020) and FAO (2018) who highlight the adverse effects of insecurity on agriculture, leading to reduced productivity, disrupted supply chains, and increased vulnerability for farmers. Pests/diseases can devastate crops and trees, impacting farmers' livelihoods. Integrated Pest Management (IPM) practices are essential to address these challenges. According to Ahmed *et al.,* (2018), in their study stated that, the effective pest management strategies are crucial for successful agroforestry. Majority (65.0%) of the respondents in the study area reported not to receive any support from government or any financial institution, where 35.0% reported to be receiving support from government (Table 6). This highlights that a substantial portion (65%) of respondents did not receive support from government or any financial institutions, underscoring the lack of external assistance in overcoming these barriers. This is contrary to the study by Heltberg (2001), who reported that "The absence of financial institutional support can significantly hinder the adoption of sustainable agroforestry practices, particularly in resource-constrained settings".

Feder *et al.* (2014), reported in their study that "In their survey findings across multiple regions indicate that inadequate government support directly impacts the adoption rates of sustainable agroforestry technologies and practices."

This is because despite the little or no support from government or institutions, all the farmers in the study area (Langel village) happily embrace agroforestry as a practice, preserving cultural heritage while maintaining sustainable land use practices, this is in agreement with the study by Brown and Jones (2016), who reported in their study that "Contrary to popular belief, our case study revealed instances where farmers exhibited higher adoption rates despite minimal government assistance, suggesting that factors beyond financial institutional aid play a significant role in technology uptake. This may be due to the advantage of some community members being staff of the neighbouring institutions, who are better enlightened and adopt some technologies which are copied by the community.

Conclusion

This study has provided valuable insights into the dynamics of agroforestry practices in Langel Village, highlighting its significance in enhancing livelihoods, promoting ecosystem services, and preserving socio-cultural values. It revealed that middle-aged farmers, predominantly male, were actively engaged in agroforestry, leveraging their experience and skills to maintain sustainable land use practices. The adoption of agroforestry practices, particularly agrosilv--iculture, has contributed substantially to household income, food security, and environmental sustainability. The retention of tree species such as Mango, Baobab, and Cashew on farmlands has not only provided economic benefits but also enhanced ecosystem services like soil fertility, moisture retention, and biodiversity. Moreover, agroforestry has played a vital role in fostering social interactions, cooperation, and cultural preservation within the community. However, the study also identified significant barriers to agroforestry adoption, primarily lack of capital, which hinders the implementation and expansion of these practices. Limited government support and financial assistance further exacerbate this challenge. Despite these constraints, the resilience and adaptability of farmers in Langel Village have enabled them to embrace agroforestry as a sustainable land use practice, contributing to their livelihoods and environmental stewardship. The study underscores the importance of addressing financial constraints and enhancing support systems to promote wider adoption of agroforestry practices. By doing so, it is possible to further enhance the livelihoods of rural communities while promoting environmental sustainability and cultural heritage. Ultimately, this research highlights the potential of agroforestry to contribute to sustainable development goals, particularly in rural areas where agriculture is a primary source of livelihood. By supporting and scaling up agroforestry initiatives, policymakers and stakeholders can help build more resilient and sustainable agricultural systems that benefit both people and the environment.

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